

## WHAT IS CLAIMED IS:

1        1.    A radio frequency (RF) demodulation circuit comprising:  
2                a radio frequency (RF) mixer having a first input port  
3 capable of receiving an incoming RF signal having a frequency of RF  
4 and a second input port capable of receiving a first local  
5 oscillator (LO) signal having a frequency of LO, wherein said RF  
6 mixer generates a first intermediate frequency (IF) signal having a  
7 frequency of IF;

8                a frequency divider circuit capable of receiving said  
9 first LO signal having said frequency of LO and generating  
10 therefrom a second local oscillator (LO) signal having a frequency  
11 of LO/N and synchronized with said first LO signal; and

12                an intermediate frequency (IF) mixer having a first input  
13 port capable of receiving said first IF signal and a second input  
14 port capable of receiving said second LO signal having said  
15 frequency of LO/N, and wherein said IF mixer generates a baseband  
16 output signal.

1        2.    The radio frequency demodulation circuit as set forth in  
2 Claim 1 wherein N is an integer.

1           3.    The radio frequency demodulation circuit as set forth in  
2    Claim 1 wherein N is an even integer.

1           4.    The radio frequency demodulation circuit as set forth in  
2    Claim 1 wherein N is 4.

1           5.    The radio frequency demodulation circuit as set forth in  
2    Claim 1 wherein a) N is an even integer, b)  $RF = LO + IF$ , and  
3    c)  $LO = IF(N)$ .

1           6.    A radio frequency (RF) receiver comprising:

2                   a receiver front-end circuit capable of receiving an  
3 incoming RF signal from an antenna and filtering and amplifying  
4 said incoming RF signal; and

5                   a radio frequency (RF) demodulation circuit coupled to  
6 said receiver front-end circuit comprising:

7                           a radio frequency (RF) mixer having a first input  
8 port capable of receiving said amplified RF signal having a  
9 frequency of RF and a second input port capable of receiving a  
10 first local oscillator (LO) signal having a frequency of LO,  
11 wherein said RF mixer generates a first intermediate frequency  
12 (IF) signal having a frequency of IF;

13                           a frequency divider circuit capable of receiving  
14 said first LO signal having said frequency of LO and  
15 generating therefrom a second local oscillator (LO) signal  
16 having a frequency of LO/N and synchronized with said first LO  
17 signal; and

18                           an intermediate frequency (IF) mixer having a first  
19 input port capable of receiving said first IF signal and a  
20 second input port capable of receiving said second LO signal  
21 having said frequency of LO/N, and wherein said IF mixer  
22 generates a baseband output signal.

1           7.    The radio frequency receiver as set forth in Claim 6  
2   wherein N is an integer.

1           8.    The radio frequency receiver as set forth in Claim 6  
2   wherein N is an even integer.

1           9.    The radio frequency receiver as set forth in Claim 6  
2   wherein N is 4.

1           10.   The radio frequency receiver as set forth in Claim 6  
2   wherein a) N is an even integer, b)  $RF = LO + IF$ , and  
3   c)  $LO = IF(N)$ .

1 11. A method of demodulating an incoming radio frequency (RF)  
2 signal having a frequency of RF comprising the steps of:

3 mixing in an RF mixer the incoming RF signal with a first  
4 local oscillator (LO) signal having a frequency of LO to thereby  
5 generate an intermediate frequency (IF) signal having a frequency  
6 of IF;

7 dividing the first LO signal having the frequency of LO  
8 and generating therefrom a second local oscillator (LO) signal  
9 having a frequency of  $LO/N$  and synchronized with the first LO  
10 signal; and

11 mixing in an intermediate frequency (IF) mixer the IF  
12 signal and the second LO signal having the frequency of  $LO/N$  to  
13 thereby generate a baseband output signal.

1 12. The method as set forth in Claim 11 wherein N is an  
2 integer.

1 13. The method as set forth in Claim 11 wherein N is an even  
2 integer.

1 14. The method as set forth in Claim 11 wherein N is 4.

1           15. The method as set forth in Claim 11 wherein a) N is an  
2 even integer, b)  $RF = LO + IF$ , and c)  $LO = IF(N)$ .

1           16. A radio frequency (RF) demodulation circuit comprising:  
2           a radio frequency (RF) mixer having a first input port  
3 capable of receiving an RF signal having a frequency of RF and a  
4 second input port capable of receiving a first local oscillator  
5 (LO) signal having a frequency of LO, wherein said RF mixer  
6 generates a first intermediate frequency (IF) signal having a  
7 frequency of IF;

8           a frequency divider circuit capable of receiving said  
9 first LO signal and generating therefrom an in-phase local  
10 oscillator (LO) signal having a frequency of  $LO/N$  and synchronized  
11 with said first LO signal and a quadrature local oscillator (LO)  
12 signal having a frequency of  $LO/N$  and synchronized with said first  
13 LO signal;

14           a first IF mixer having a first input port capable of  
15 receiving said first IF signal and a second input port capable of  
16 receiving said in-phase LO signal, wherein said first IF mixer  
17 generates an in-phase baseband output signal; and

18           a second IF mixer having a first input port capable of  
19 receiving said first IF signal and a second input port capable of  
20 receiving said quadrature LO signal, wherein said second IF mixer  
21 generates a quadrature baseband output signal.

1           17. The radio frequency demodulation circuit as set forth in  
2 Claim 16 wherein N is an integer.

1           18. The radio frequency demodulation circuit as set forth in  
2 Claim 16 wherein N is an even integer.

1           19. The radio frequency demodulation circuit as set forth in  
2 Claim 16 wherein N is 4.

1           20. The radio frequency demodulation circuit as set forth in  
2 Claim 16 wherein a) N is an even integer, b)  $RF = LO + IF$ , and  
3 c)  $LO = IF(N)$ .



1           21. A radio frequency (RF) receiver comprising:

2                 a receiver front-end circuit capable of receiving an  
3 incoming RF signal from an antenna and filtering and amplifying  
4 said incoming RF signal; and

5                 a radio frequency (RF) demodulation circuit coupled to  
6 said receiver front-end circuit comprising:

7                     a radio frequency (RF) mixer having a first input  
8 port capable of receiving said amplified incoming RF signal  
9 having a frequency of RF and a second input port capable of  
10 receiving a first local oscillator (LO) signal having a  
11 frequency of LO, wherein said RF mixer generates a first  
12 intermediate frequency (IF) signal having a frequency of IF;

13                     a frequency divider circuit capable of receiving  
14 said first LO signal and generating therefrom an in-phase  
15 local oscillator (LO) signal having a frequency of LO/N and  
16 synchronized with said first LO signal and a quadrature local  
17 oscillator (LO) signal having a frequency of LO/N and  
18 synchronized with said first LO signal;

19                     a first IF mixer having a first input port capable  
20 of receiving said first IF signal and a second input port  
21 capable of receiving said in-phase LO signal, wherein said  
22 first IF mixer generates an in-phase baseband output signal;

23           and  
24                   a second IF mixer having a first input port capable  
25           of receiving said first IF signal and a second input port  
26           capable of receiving said quadrature LO signal, wherein said  
27           second IF mixer generates a quadrature baseband output signal.

20050923 1           22. The radio frequency receiver as set forth in Claim 21  
2           wherein N is an integer.

20050923 1           23. The radio frequency receiver as set forth in Claim 21  
2           wherein N is an even integer.

20050923 1           24. The radio frequency receiver as set forth in Claim 21  
2           wherein N is 4.

1           25. The radio frequency receiver as set forth in Claim 21  
2           wherein a) N is an even integer, b)  $RF = LO + IF$ , and  
3           c)  $LO = IF(N)$ .

1           26. A method of demodulating an incoming radio frequency (RF)  
2 signal having a frequency of RF comprising the steps of:

3                 mixing in an RF mixer the incoming RF signal with a first  
4 local oscillator (LO) signal having a frequency of LO to thereby  
5 generate an intermediate frequency (IF) signal having a frequency  
6 of IF;

7                 dividing the first LO signal having the frequency of LO  
8 and generating therefrom an in-phase local oscillator (LO) signal  
9 having a frequency of  $LO/N$  and synchronized with the first LO  
10 signal and a quadrature local oscillator (LO) signal having a  
11 frequency of  $LO/N$  and synchronized with the first LO signal;

12                 mixing in a first intermediate frequency (IF) mixer the  
13 IF signal and the in-phase LO signal to thereby generate an in-  
14 phase baseband output signal; and

15                 mixing in a second intermediate frequency (IF) mixer the  
16 IF signal and the quadrature LO signal to thereby generate a  
17 quadrature baseband output signal.